# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference<br>ACR 2936 WO | **FOR FURTHER ACTION** | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
|---|---|---|
| International application No.<br>PCT/EP 03/03241 | International filing date *(day/month/year)*<br>25.03.2003 | Priority date *(day/month/year)*<br>08.04.2002 |
| International Patent Classification (IPC) or both national classification and IPC<br>B01D53/60 | | |
| Applicant<br>AKZO NOBEL N.V.et al. | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

| Date of submission of the demand | Date of completion of this report |
|---|---|
| 14.07.2003 | 16.02.2004 |
| Name and mailing address of the international preliminary examining authority:<br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized Officer<br>Fourgeaud, D<br>Telephone No. +49 89 2399-7047 |

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No. PCT/EP 03/03241

## I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

**Description, Pages**

1-19 as published

**Claims, Numbers**

1-17 as published

**Drawings, Sheets**

1/3-3/3 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   *(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | |
|---|---|---|
| Novelty (N) | Yes: Claims<br>No: Claims | claims 1-17 |
| Inventive step (IS) | Yes: Claims<br>No: Claims | claims 1-17 |
| Industrial applicability (IA) | Yes: Claims<br>No: Claims | claims 1-17 |

2. Citations and explanations

   **see separate sheet**

## Re Item I

## Basis of the report

The examination is being carried out on the **following application documents:**

Text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LT LU LV MC MK NL PL PT RO SE SI SK TR

**Description, pages:**

1-19 as published

**Claims, No.:**

1-17 as published

**sheets:**

1/3-3/3 as published

Reference is made to the following documents:

D1: WO 00 02646 A (VERBRAAK PETRUS LEONARDUS; BIOSTAR BV (NL)) 20 January 2000 (2000-01-20) cited in the application
D2: WO 92 17401 A (DOW CHEMICAL CO) 15 October 1992 (1992-10-15)
D3: US-A-5 476 591 (GREEN DENNIS H) 19 December 1995 (1995-12-19)
D4: US-A-4 921 683 (BEDELL STEPHEN A) 1 May 1990 (1990-05-01)
D5: EP-A-1 059 111 (INST FRANCAIS DU PETROL) 13 December 2000 (2000-12-13)
D6: US-A-4 808 385 (ROBERT R. GRINSTEAD) 28 February 1989 (1989-02-28)

## Re Item V

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1.** The subject-matter of claim 1 of the present application concerns a method for removing a nitrogen oxide from a gas by bringing the gas into contact with a liquid in a scrubber, said liquid comprising a metal ion chelate and a biomass (such as bacteria, yeast). A portion of this liquid is submitted to a membrane separation process, characterized in that in a first step the liquid is submitted to a first filtration with a first membrane, leading to a first permeate liquid containing the ion chelate, in a second step said first permeate is submitted to a nanofiltration process which leads to a second retentate liquid comprising the ion chelate, and recycling at least a part of the second retentate liquid to the scrubber.
The subject-matter of claim 17 of the present application calls for a device allowing to carry out the method of claim 1 and of the associated dependent claims.

**2.** D1 which is considered to be the closest prior art, discloses a similar process, with a treatment of the scrub liquid. Nevertheless, if it is foreseen in D1 (see pages 5, [illegible]0-30) to use a chelate separator in the form of a membrane filter, it is not precised which membrane is to be used to carry out this filtration. And no hints is given to use a nanofiltration membrane associated with another permeation membrane, preferentially an ultrafiltration membrane.
D2-D6 do not disclose such a method too, consequently is the subject-matter of claim 1 novel over the cited prior art (Art.33(2) PCT).

**3.** The problem that solves the present application is to propose a method allowing to recycle a scrub liquid containing an ion chelate and a biomass.

**4.** In D2, which discloses a process to treat a gas charged with $H_2S$, a teaching can be found (see example 4) for using arranged in series an ultrafiltration membrane and a nanofiltration membrane to treat a liquid. But in D2, a scrub liquid containing only an ion chelate mixed with other components, but not a biomass, is treated.
A person skilled in the art does not find any encouragement in D2 to use the particular embodiment of example 4 using two separation membranes for separating a scrub liquid comprising a biomass and an ion chelate agent.

The same remark applies to D3-D6.
Then, the subject-matter of claim 1 of the present application involves an inventive step in the sense of Article 33(3) PCT:

**5.** Concerning the subject-matter of claim 17 of the present application which is oriented on a device to carry out the membrane separation process of claim 1, it appears to be clearly novel over the available prior art (Art. 33(2) PCT).
Said device (membrane separation unit) comprises an optional first pretreatment module, a first membrane filtration compartment, a second pretreatment module, and a second nanofiltration membrane compartment.
The distinguishing feature between this apparatus and the one disclosed in example 4 of D2 is the presence of the second pretreatment module before the nanofiltration membrane compartment. Such a device according to the description(see page 9, lines 24-31), prevents the scaling of the membrane. There is here again no hints to place such a device before the nanofiltration membrane compartment in the other documents of the prior art because of the different nature of the liquid which is to be treated i.e. in the present application the aim is firstly to separate the biomass from the ion chelate, which is not disclosed in the prior art in such a manner.
Consequently, the subject-matter of claim 17 of the present application is considered to involve an inventive step too.